The opinion in support of the decision being entered today
is *not* binding precedent of the Board

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte KANU G. SHAH,
FRANK W. POPIELAS, and DENNIS F. PERSON

Appeal 2007-2133
Application 10/790,502
Technology Center 1700

Decided: September 25, 2007

Before EDWARD C. KIMLIN, CHARLES F. WARREN, and
PETER F. KRATZ, *Administrative Patent Judges.*

WARREN, *Administrative Patent Judge.*

DECISION ON APPEAL

Applicants appeal to the Board from the decision of the Primary Examiner rejecting for at least the second time claims 25 through 38 in the Office Action mailed October 14, 2005. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (2005).

We affirm the decision of the Primary Examiner.

Claims 25, 27, 29, and 36 illustrate Appellants' invention of a process for sealing and insulating a fuel cell plate and an insulated fuel cell plate prepared by a coating process, and are representative of the claims on appeal:

25. A process for sealing and insulating a fuel cell plate, the process comprising:

providing a gas impermeable fuel cell plate having first and second surfaces;

applying an epoxy nitrile resin at generally ambient temperatures on at least the first surface of the fuel cell plate, the coating precursor adapted to polymerize or to cross-link in response to infrared radiation; and

exposing epoxy nitrile resin on the fuel cell plate to infrared radiation to initiate polymerization or cross-linking.

27. The process of claim 25, wherein the epoxy nitrile resin is exposed to infrared radiation for about less than about forty five minutes.

29. An insulated fuel cell plate comprising:

a gas impermeable plate having first and second surfaces; and

a solid coating polymerized or cross-linked in response to infrared radiation at generally ambient temperatures and adhering to at least one of the first and second surfaces of the plate, the solid coating comprising an epoxy nitrile resin.

36. An insulated fuel cell plate comprising:

a gas impermeable plate having first and second surfaces; and

a coating polymerized or cross-linked in response to infrared radiation and adhering to at least one of the first and second surfaces of the plate, the coating consisting essentially of an epoxy nitrile resin.

The Examiner relies upon the evidence in these references:

Siebert	US 4,025,578	May 24, 1977
Pellegri	US 4,197,178	Apr. 8, 1980
Canfield	US 6,274,262 B1	Aug. 14, 2001

Vincent D. McGinniss, "Radiation Curing," *Kirk-Othmer Encyclopedia of Chemical Technology*, *20*, 8-44-47, 853-55 (4th ed., New York, John Wiley & Sons, 1996) (McGinniss).

Appellants request review of the following grounds of rejection advanced on appeal (Br. 4):

claims 25 through 32 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention (Answer 4);[1]

claims 25 through 38 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement (*id.* 3);

claims 29 through 31 and 36 through 38 under 35 U.S.C. § 103(a) as unpatentable over Pellegri in view of Siebert (*id.* 4);

claims 25, 27, 28, 32, 34, and 35 under 35 U.S.C. § 103(a) as unpatentable over Pellegri in view of Siebert as applied, further in view of McGinniss (*id.* 5); and

claims 26 and 33 under 35 U.S.C. § 103(a) as unpatentable over Pellegri in view of Siebert, further in view of McGinniss as applied, and further in view of Canfield (*id.* 6).

Appellants argue the claims in each of the first two grounds of rejection as a group (Br. 5-7). Appellants group the product claims of the third ground of rejection as claim 29, claims 30 and 31, claim 36, and claims 37 and 38, predominately arguing claim 29 (*id.* 7, 11, and 12). We note here that claims 30, 31, 37, and 38 encompass substantially similar subject matter. Appellants group the process claims of the fourth ground of rejection as claim 25, claims 27 and 28, and claim 32, predominately arguing claim 25 and permitting dependent claims 34 and 35 to stand or fall with independent claim 32 (*id.* 13 and 14). Appellants argue the claims in

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[1] The rejection of claims 36 through 38 under 35 U.S.C. § 112, second paragraph, is withdrawn by the Examiner (Answer 3).

the fifth ground of rejection as a group (*id.* 15). Thus, we decide this appeal based on independent claims 25, 29, 32, and 36, and on dependent claims 27, 33, and 37, as representative of the grounds of rejection and Appellants' groupings of claims, to the extent argued in the Brief. 37 C.F.R. § 41.37(c)(1)(vii) (2005).

The issues in this appeal are whether the Examiner has carried the burden of establishing a prima facie case in each of the grounds of rejection advanced on appeal.

The issues in this appeal entail the interpretation of the claims. We interpret independent claims 25, 29, 32, and 36, and dependent claims 27, 33, and 37, by giving the terms thereof the broadest reasonable interpretation in their ordinary usage in context as they would be understood by one of ordinary skill in the art, in light of the written description in the Specification unless another meaning is intended by Appellants as established therein, and without reading into the claim any disclosed limitation or particular embodiment. *See, e.g., In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364, 70 USPQ2d 1827, 1830 (Fed. Cir. 2004); *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1666-667 (Fed. Cir. 2000); *In re Morris*, 127 F.3d 1048, 1054-055, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989).

The plain language of independent process claim 25 specifies a process of coating any fuel cell plate comprising at least the steps of, among other things, (1) applying in any manner any epoxy nitrile resin on at least a first surface of the plate "at generally ambient temperatures," wherein "the

coating precursor" for the epoxy nitrile resin are "adapted to polymerize or to cross-link in response to infrared radiation; and (2) "exposing the nitrile resin" that has been applied on the plate "to infrared radiation to initiate polymerization." Independent process claim 32 has the same two steps, but applies "a coating consisting essentially of epoxy nitrile" and the "coating precursor" is exposed to infrared radiation. Process claim 27, dependent on claim 25, specifies "the epoxy nitrile resin is exposed to infrared radiation for about less than about forty five minutes." Process claim 33, dependent on claim 32, specifies the epoxy nitrile resin is applied by any manner of "screen printing."

The plain language of independent product-by-process product claim 29 specifies any fuel cell plate comprising at least any plate characterized by a "solid coating comprising epoxy nitrile resin" adhering to at least one surface formed by the process wherein the "solid coating [is] polymerized or cross-linked in response to infrared radiation at generally ambient temperatures." *See, e.g., In re Thorpe*, 777 F.2d 695, 697, 227 USPQ 964, 966 (Fed. Cir. 1985). Independent product-by-process claim 36 differs only in "the coating consisting essentially of epoxy nitrile resin" which is not required to be solid. Claim 37, dependent on claim 36, require the "coating is less than about 250 μ thick."

We first consider the claim terms "epoxy nitrile resin" and "coating precursor." Appellants state in the Specification that "'resins' . . . refer to polydisperse systems containing monomers, oligomers, or combinations thereof" (Specification 6:23-25). Appellants further disclose "coating 132

. . . applied on the plates . . . in a fluid state and then solidified in situ, comprises a blend of one or [sic] reactive coating precursors that are subsequently polymerized and/or cross-linked" (*id.* 6:4-6). Appellants further state "[h]ere, 'reactive' means that the components of the coating 132 react with one another other[sic] or self-react to cure (solidify)" (*id.* 6:6-8).

Appellants disclose "Epoxy-Nitrile Resins" which include, among other things, such resins from "useful components of the coating precursor [which] include an epoxy resin, an acrylonitrile butadiene copolymer, an optional film-forming thermoplastic polymer, . . . and a polyamine cross-linking agent," identifying these ingredients as the "reactive coating precursor" (*id.* 18:5-12). The coating precursor composition can include solvents as well as numerous additives, including fillers, plasticizers, and pigments (*id.* 18: 12-15 and 20:11-29). The examples of the reactive "epoxy resins" include diglycidyl ethers of aromatic and aliphatic polyols, which can contain two or more epoxy groups; the reactive "acrylonitrile butadiene copolymer" include carboxylic acid group containing copolymers; and the reactive "polyamine cross-linking agent," that is, "curing agent," include "aliphatic, alicyclic, or aromatic polyamines" (*id.* 18:18 to 19:24). In addition to the polyamine curing agent, the reactive coating precursor compositions can optionally include a catalyst (Specification 19:12-13). The polyamine curing agent "can react with carboxylic acid groups . . . of the acrylonitrile butadiene copolymer and the oxirane groups[, that is, epoxy groups,] of the epoxy resin" (*id.* 19:13-15).

Examples of epoxy nitrile resin reactive precursor compositions containing these ingredients, thus resulting in epoxy nitrile resins upon curing by, in this case, cross-linking, are disclosed (*id.* 24:19 to 25:11 and Table 3).

Thus, on this record, the terms "epoxy nitrile resin" and "coating precursor" include at least the fluid, reactive precursor compositions as disclosed which when crosslinked, provide a solid epoxy nitrile resin. The Specification discloses that such precursor compositions "can be applied using coating techniques . . . apparent to persons of ordinary skill in the art," including roller coating, brushing, spraying, and screen printing, "to one or both sides of the fuel cell plate . . . as cover-all coating or in selected continuous or discontinuous patterns depending on the insulating and sealing requirements" (Specification 21:2-10).

We now consider the phrases "cross-link in response to infrared radiation" and "infrared radiation to initiate polymerization or cross-linking," and the term "generally ambient temperature" used in connection therewith in product claims 29 and 36. Appellants disclose that epoxy nitrile resin reactive precursor compositions are "typically cured by exposure to elevated temperature for a sufficient time to effect cross-linking of the reactive components and to volatilize the solvents" (Specification 18:15-17). The examples of epoxy nitrile resin reactive precursor composition samples which were "applied to steel plates were cured in a forced air (convection) oven for about 10 minutes at about 180°C; the samples applied on graphite composite fuel cell plates were also cured in the forced air oven, but were cured at about 140C° for at least 30 minutes" (*id.*

25:7-10). In this respect, Appellants also disclose that since "the coating precursor is capable of polymerizing (curing) in response to exposure to energy, the method also includes heating the coating precursor on the fuel cell plate via radiant (infrared) heating or convective heating to initiate polymerization," in which "[u]seful coating precursors include epoxy nitrile resins" (*id.* 4:5-8).

Appellants further disclose that "[d]epending on the type of reactive components employed, the coating 132 can be cross-linked and/or polymerized using any number of mechanisms, including oxidative curing, moisture curing, thermal curing, high energy radiation curing (e.g., ultraviolet curing, electron beam curing), condensation and addition polymerization, and the like" (Specification 6:8-12). Appellants disclose reactive precursors, including acrylate resins, such as acrylated epoxies, and epoxy resins,

> can be cured using mechanisms described above, typically in less than 45 minutes. Rapidly acting forms of radiation, which required application for less than about 30 seconds, and in some cases, for less than about 5 seconds are particularly useful. Useful forms of radiation include ultraviolet (UV) radiation, infrared radiation, microwave radiation, and electron beam radiation. . . .
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> Exposing the coating precursor to high energy radiation represents a particularly useful method of polymerizing the reactive components in the coating precursors, offering additional advantages for . . . coatings 132 over thermally-cured reactive coating precursors. For instance, radiation cured coating precursors can be cross-linked at much lower temperatures (e.g., ambient temperature) than heat-cured reactive coating precursors. This is an advantage when using graphite composite fuel cell plates that can warp at temperatures associated with heat-cured coatings. Radiation

> curing can proceed via at least two mechanisms. In a first mechanism, radiation provides fast and controlled generation of highly reactive species (free radicals) that initiate polymerization of unsaturated materials. In a second mechanism, radiation (UV/electron beam) activate certain cationic photoinitiators that decompose to yield an acid catalyst that propagates the cross-linking reaction. For the purposes of this disclosure, "thermally-cured" or "heat cured" refers to coating precursors cross-linked using heating processes dominated by convection and/or conduction.

Id. 6:13 to 7:7.

Appellants disclose "[e]xamples of reactive precursors that can be cured using high energy radiation (ultraviolet, electron beam, and so on) include, but are not limited to the acrylate resins," including acrylated epoxies (Specification 7:9-10). Examples of acrylate resin compositions were "cured by successive exposure to . . . UV lamps . . . at line speeds of 15-25 feet per minute" (*id.* 22:10-12). The use of this curing mechanism with other kinds of reactive precursors is not disclosed.

We determine one of ordinary skill in this art would find in this disclosure the teachings that the epoxy nitrile reactive precursor coating composition embodiments are "thermally cured" or "heat cured," and no disclosure with respect thereto involves high energy radiation curing. Indeed, the disclosure equates radiant heating by infrared radiation with convection heating, and distinguishes this form of curing from high energy radiation curing, which latter disclosure does not include reference to infrared radiation. In this respect, this person would have been aware that epoxy functional polymers, acid functional polymers, and polyfunctional amines are known in the art to comprise thermally curable polymer systems

which can be cured with heat from infrared radiation, that does not include ultraviolet and visible light energy irradiation or photocuring of coat compositions, a as evinced by McGinniss (McGinniss, e.g., 845-47, 854 and Tables 8 and 9).

Thus, on this record, we interpret the phrases "cross-link in response to infrared radiation" and "infrared radiation to initiate polymerization or cross-linking" to encompass the use of infrared radiation to thermally cure the epoxy resin precursor compositions. Our interpretation comports with the requirement of claim 27 to expose the epoxy nitrile resin to infrared radiation for less than 45 minutes, which time period exceeds that taught in the Specification for high energy radiation curing.

We further point out the term "generally ambient temperatures" is not disclosed in the Specification with respect to thermal curing, and the passage in the Specification referred to by Appellants with respect to this term does not describe any embodiment of a epoxy nitrile resin coating precursor compositions (Specification 6:20-22 and 26-31, and 7:1-7; Br. 4; *see above* pp. 8-9).[2] To the extent Appellants intend the phrases "cross-link in response to infrared radiation" and "infrared radiation to initiate

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[2] To the extent that the term "infrared radiation" used in the claim involves high energy radiation as Appellants intends (Br., e.g., 8), the Examiner should consider whether such an embodiment is described in the written description of the Specification as required by 35 U.S.C. § 112, first paragraph, written description requirement, upon any further prosecution of the appealed claims subsequent to the disposition of this appeal. *See In re Alton*, 76 F.3d 1168, 1172, 1175-176, 37 USPQ2d 1578, 1583 (Fed. Cir. 1996) (a prima facie case is established by a showing that a claim encompasses "embodiments of the invention that are completely outside the scope of the specification").

polymerization or cross-linking," and thus, the claim, to be limited to high energy radiation curing by using the term "generally ambient temperatures" (Br., e.g., 8), it is well settled that Applicants' mere intent as to the scope of the claimed invention does not so limit the scope of a claim which is otherwise definite when construed in light of the specification as it would be interpreted by one of ordinary skill in the art. *In re Cormany*, 476 F.2d 998, 1000-002, 177 USPQ 450, 451-53 (CCPA 1973).[3]

Furthermore, we consider the term "ambient temperature" to have its common, art recognized meaning of "[t]he temperature of the surrounding medium, such as gas or liquid, which comes into contact with the apparatus."[4] Thus, in the context of the claim language and in light of the Specification, the claim term "generally ambient temperature" would be that temperature imparted by the infrared radiation to the coating applied to the plate during the thermal curing process plus whatever temperature is imparted to the process by heat from other sources.

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[3] Any conflict between Appellants' *intended* invention and the actual scope of the appealed claims should be also considered with respect to 35 U.S.C. § 112, second paragraph, on the basis of whether appealed claims are "claiming the subject matter which applicant regards as his invention," in any further prosecution of the appealed claims subsequent to disposition of this appeal. *See Cormany*, 476 F.2d at 1000-002, 177 USPQ at, 451-53; *see also Zletz*, 893 F.2d at 321-22, 13 USPQ2d at 1322 (citing *In re Prater*, 415 F.2d 1393, 1404-405, 162 USPQ 541, 550-51 (CCPA 1969).

[4] See, e.g., **ambient temperature**, *McGraw-Hill Dictionary of Scientific and Technical Terms* 75 (5th ed., Sybil P. Parker, ed., New York, McGraw-Hill, Inc. 1994); **ambient**, *The American Heritage Dictionary of The English Language* 56 (4th ed., Boston, Houghton Mifflin Company, 2000).

Accordingly, we determine that contrary to the Examiner's position (Answer 3-4), one of ordinary skill in the art would not find the term "generally ambient temperature" indefinite, *see, e.g., In re Warmerdam*, 33 F.3d 1354, 31 USPQ2d 1754, 1759 (Fed. Cir. 1994); *In re Moore*, 439 F.2d 1232, 1235, 169 USPQ 236, 238 (CCPA 1971), and would recognized Appellants were in possession of the claimed inventions encompassed by the claims at the time the Application was filed. *See, e.g., Alton*, 76 F.3d 1168, at 1175-76, 37 USPQ2d at 1581, 1583-584 (Fed. Cir. 1996) (citing *In re Wertheim*, 541 F.2d 257, 262-64, 191 USPQ 90, 96-97 (CCPA 1976)).

Therefore, in the absence of a prima facie case of non-compliance with §§ 112, first paragraph, written description requirement, and second paragraph, we reverse the grounds of rejection based on these statutory provisions.

We agree with the Examiner's findings of fact from Pellegri, Siebert, McGinniss, and Canfield (Answer 4-7), to which we add the following. Pellegri would have disclosed to one of ordinary skill in this art coating a fuel cell plate with a layer of chemically resistant and electrically non-conductive coating, wherein the coating is prepared from a liquid reactive precursor coating composition containing epoxy resins and aromatic polyamine hardeners, that is, crosslinking agents, which is applied to the plate by brushing and the coated plate cured in an oven at 100°C for five hours to obtain a hardened resin coating (Pellegri, e.g., col. 2, ll. 50-59; col. 4, ll. 2-12, 25-31 and 44-50; and col. 7, ll. 31-40).

We find Siebert would have disclosed to one of ordinary skill in this art a liquid polymer composition containing an epoxy resin, which can be diglycidyl ethers of polyols, that is, containing an average of two epoxide groups; a liquid carboxylic acid terminated polymer, which can be carboxylic acid terminated poly(butadiene-acrylonitrile); a dihydric compound; and "an amine having selectivity for a carboxyl-epoxide reaction" to cure or harden the same (Siebert, e.g., col. 2, l. 23, to col. 6, l. 22). Siebert discloses the composition can be cured at a temperature of from about 80 to about 180°C to prepare an elastomeric solid (*id.*, e.g., col. 6, ll. 23-41, and col. 7, ll. 32-50). The liquid polymer composition can include other ingredients, such as fillers, colorants, and plasticizers (*id.* col. 6, l. 66, to col. 7, l. 31). The liquid polymer composition can be used for, among other things, castable gaskets seals and o-rings, flowable coatings for materials, flowable adhesives, encapsulation of electrical components and general molded products (*id.* col. 7, ll. 51-57).

We determine the combined teachings of Pellegri and Siebert alone, as further combined with McGinniss, and as still further combined with Canfield, the scope of which the Examiner finds and we further determined above, provide convincing evidence supporting the Examiner's case that the claimed process for sealing and insulating a fuel cell plate and the insulated fuel cell plate encompassed by claims 25, 27, 29, 32, 33, 36, and 37, as we interpreted these claims above, would have been prima facie obviousness of to one of ordinary skill in the coating arts familiar with coating epoxy nitrile resins on materials including fuel cell plates.

We agree with the Examiner that this person would have used Siebert's liquid, thermal curable, reactive precursor coating composition as the liquid, thermal curable, reactive precursor coating composition in Pellegri's process in the reasonable expectation of coating the fuel cell plates with a solid elastomeric coating in view of Seibert's teachings that the compositions thereof form gaskets, have adhesive properties and can encapsulate electrical components.

We further agree with the Examiner that this person would have reasonably expected to successfully thermally cure the liquid compositions of Pellegri and Siebert with infrared radiation thermal heating as suggested by McGinniss, achieving the same or similar results as convection heating. We still further agree with the Examiner that this person would have reasonably expected to successfully apply the liquid compositions of Pellegri and Siebert with screen printing as suggested by Canfield, because Pellegri disclose applying the liquid compositions by various means including brushing and pouring, and Siebert discloses the liquid compositions that can be poured and are flowable.

Accordingly, we determine that one of ordinary skill in the art routinely following the combined teachings of the references would reasonably have arrived at the claimed processes and products encompassed by claims 25, 27, 29, 32, 33, 36, and 37 without recourse to Appellants' Specification. *See, e.g., KSR Int'l Co. v. Teleflex, Inc.,* 127 S. Ct. 1727, 1739, 82 USPQ2d 1385, 1395 (2007) (a patent claiming a combination of elements known in the prior art is obvious if the improvement is no more than the predictable use of the prior art elements according to their

established functions); *In re Kahn*, 441 F.3d 977, 985-88, 78 USPQ2d 1329, 1334-337 (Fed. Cir. 2006); *In re Dow Chem. Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988);[5] *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981);[6] *see also In re O'Farrell*, 853 F.2d 894, 903-04, 7 USPQ2d 1673, 1680-681 (Fed. Cir. 1988) ("Obviousness does not require absolute predictability of success. . . . For obviousness under § 103, all that is required is a reasonable expectation of success." (citations omitted).

We are not convinced otherwise by Appellants' position. With respect to the first ground of rejection under § 103(a), we determine that, on this record, Appellants do not present effective argument or objective evidence establishing that the claimed epoxy nitrile resin coated fuel cell plates characterized by thermally curing a reactive precursor coating composition by infrared radiation patentably distinguishes over the epoxy

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5 The consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that [the claimed process] should be carried out and would have a reasonable likelihood of success viewed in light of the prior art. [Citations omitted] Both the suggestion and the expectation of success must be founded in the prior art, not in the applicant's disclosure.

Dow Chem., 837 F.2d at 473, 5 USPQ2d at 1531.

6 The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.

Keller, 642 F.2d at 425, 208 USPQ at 881.

nitrile resin coated fuel cell plates of Pellegri's prepared by thermally curing a reactive precursor coating composition of Siebert by convection (Br. 7-9). *See, e.g., In re Best*, 562 F.2d 1252, 1255-256, 195 USPQ 430, 433-34 (CCPA 1977);[7] *see also, e.g., Thorpe*, 777 F.2d at 697, 227 USPQ at 966. In this respect, we are of the opinion it was well known that resin coating composition thermally curable to a solid by convection can reasonably be thermally cured with infrared radiation. *See In re Ahlert*, 424 F.2d 1088, 1091-092, 165 USPQ 418, 420-21 (CCPA 1970) (notice may be taken "of facts beyond the record which, while not generally notorious, are capable of such instant and unquestionable demonstration as to defy dispute"). Furthermore, we cannot agree with Appellants that one of ordinary skill in this art would not have considered Siebert's composition capable of coating a fuel cell plate except by pouring (Br. 9-10; Reply Br. 4-5). Indeed, the reference teaches flowable compositions and Pellegri discloses epoxy resin coating composition can be brushed onto a substrate. In this respect, we further point out there is no limitation in claims other than in process claims

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[7] Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. See *In re Ludtke*, [441 F.2d 660, 169 USPQ 563 (CCPA 1971)]. Whether the rejection is based on "inherency" under 35 U.S.C. § 102, on "prima facie obviousness" under 35 U.S.C. § 103, jointly or alternatively, the burden of proof is the same, and its fairness is evidenced by the PTO's inability to manufacture products or to obtain and compare prior art products. [Footnote and citation omitted.]

Best, 562 F.2d at 1255, 195 USPQ at 433-34.

26 and 33, on the manner in which the coating compositions are applied to the plate, and, thus, the claims encompass methods in which the composition is poured onto the plate in a mold. *See In re Self*, 671 F.2d 1344, 1348-349, 213 USPQ 1, 5 (CCPA 1982).

We cannot agree with Appellants that the claimed invention has the advantage that curing with infrared radiation will not warp a graphite composite fuel cell as set forth in the Specification at page 6, l. 29, to page 7, l. 1 (Br. 9; Reply Br. 5-6). We pointed out above that the cited Specification passage pertains to high energy radiation curing, and not thermal curing by infrared radiation. Further, as Appellants recognize, Pellegri teaches thermal curing of an epoxy resin coating on a graphite containing fuel cell plate without warping the plate. We also cannot agree with Appellants' contention the claims specifying thickness are patentable because Appellants' reason for selecting the claimed thickness is not that taught by the references (Br. 11 and 12; Reply Br. 6-7 and 8). The applied prior art renders these claims unpatentable even if the references do not disclose the same reasons for arriving at the coating thicknesses as Appellants. *See In re Kronig,* 539 F.2d 1300, 1304, 190 USPQ 425, 428, (CCPA 1976) ("[I]t is sufficient here that [the reference] clearly suggests doing what appellants have done."); *see also In re Kemps*, 97 F.3d 1427, 1429-430, 40 USPQ2d 1309, 1311 (Fed. Cir, 1996) (citing *In re Dillon*, 919 F.2d 688, 693, 16 USPQ2d 1897, 1901 (Fed. Cir. 1990) (*en banc*)).

We agree with the Examiner that on this record, and contrary to Appellants' contentions, the limitation "consisting essentially of an epoxy nitrile resin " does not preclude additional ingredients such as an "amine" in

the coating composition used to prepare the product of claim 36 (Br. 12; Reply Br. 7) for several reasons. First, as we discussed above, the epoxy nitrile resin compositions as claimed include polyamines for crosslinking purposes as disclosed in the Specification. And, second, as we discussed above, the Specification discloses a large number of additives for such compositions, and we further find no disclosure in the Specification of any ingredients that are identified as materially affecting the formation of a solid crosslinked epoxy nitrile resin coating. *See, e.g., In re Herz*, 537 F.2d 549, 551-52, 190 USPQ 461, 463 (CCPA 1976) ("[I]t is necessary and proper to determine whether [the] specification reasonably supports a construction" that would exclude or include particular ingredients.); *see also, e.g., PPG Indus., Inc. v. Guardian Indus. Corp.*, 156 F.3d 1351, 1354-357, 48 USPQ2d 1351, 1353-356 (Fed. Cir. 1998) (Patentees "could have defined the scope of the phrase 'consisting essentially of' for purposes of its patent by making clear in its specification what it regarded as constituting a material change in the basic and novel characteristics of the invention. The question for our decision is whether PPG did so.").

With respect to the second ground of rejection under § 103(a), contrary to Appellants' position (Br. 13-14; Reply Br. 8-9), we find sufficient evidence in McGinniss establishing that one of ordinary skill in this art would have modified Pellegri's thermal curing process by using infrared radiation thermal heating in place of convection heating disclosed in the reference (Br. 13-14; Reply Br. 8-9). Indeed, we are of the opinion one of ordinary skill in this art would have reasonably substituted one of these equivalent forms of thermal heating epoxy resin compositions for

another with the reasonable expectation of the same or similar results even without an express suggestion in McGinniss. *See, e.g., In re Siebentritt*, 372 F.2d 566, 567-68, 152 USPQ 618, 619 (CCPA 1967) (express suggestion to interchange methods which achieve the same or similar results is not necessary to establish obviousness). The amount of time necessary to conduct thermal curing by infrared radiation is a result effective variable that would one of ordinary skill in the art would determine based on the coating composition and the material in the plate. *See, e.g., In re Aller*, 220 F.2d 454, 456-58, 105 USPQ 233, 235-37 (CCPA 1955). (it is not inventive to discover by routine experimentation optimum or workable ranges for general conditions disclosed in the prior art).

Finally, with respect to the last ground of rejection under § 103(a), contrary to Appellants' position (Br. 15-16; Reply Br. 10-11), we determined above one of ordinary skill in this can apply Siebert's liquid, flowable, epoxy nitrile resin reactive precursor coating composition by brushing or pouring in light of Pellegri, and thus, can use such composition in a screen printing process. Indeed, there is no limitation on the "screen printing" process as claimed. *See Self*, 671 F.2d at 1348-349, 213 USPQ at 5.

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Pellegri and Siebert alone, combined further with McGinniss, and combined still further with Canfield, with Appellants' countervailing evidence of and argument for nonobviousness and conclude

that the claimed invention encompassed by appealed claims 25 through 38 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

The Primary Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED

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